$$\dot{n}_{exh} = \frac{7.559 \cdot 0.869 \cdot (1 + 0.10764)}{12.0107 \cdot 0.09987}$$

$\dot{n}_{exh}$ = 6.066 mol/s

(f) *Calculated raw exhaust molar flow rate from measured intake air molar flow rate, dilute exhaust molar flow rate, and dilute chemical balance.* You may calculate the raw exhaust molar flow rate, $\dot{n}_{exh}$, based on the measured intake air molar flow rate, $\dot{n}_{int}$, the measured dilute exhaust molar flow rate, $\dot{n}_{dexh}$, and the values calculated using the chemical balance in paragraph (c) of this section. Note that the chemical balance must be based on dilute exhaust gas concentrations. For continuous-flow calculations, solve for the chemical balance in paragraph (c) of this section at the same frequency that you

update and record $\dot{n}_{int}$ and $\dot{n}_{dexh}$. This calculated $\dot{n}_{exh}$ may be used for the PM dilution ratio verification in § 1065.546; the calculation of dilution air molar flow rate in the background correction in § 1065.667; and the calculation of mass of emissions in § 1065.650(c) for species that are measured in the raw exhaust.

(1) *Crankcase flow rate.* If engines are not subject to crankcase controls under the standard-setting part, calculate raw exhaust flow as described in paragraph (e)(1) of this section.

(2) *Dilute exhaust and intake air molar flow rate calculation.* Calculate $\dot{n}_{exh}$ as follows:

$$\dot{n}_{exh} = \left(x_{raw/exhdry} - x_{int/exhdry} \right) \cdot \left(1 - x_{H2Oexh} \right) \cdot \dot{n}_{dexh} + \dot{n}_{int}$$

Eq. 1065.655-22

Example:

$\dot{n}_{int}$ = 7.930mol/s

$x_{raw/exhdry}$ = 0.1544 mol/mol

$x_{int/exhdry}$ = 0.1451 mol/mol

x_{H2Oexh} = 32.46 mmol/mol - 0.03246 mol/mol

$\dot{n}_{dexh}$ = 49.02 mol/s

$\dot{n}_{exh}$ = (0.1544 − 0.145(· (1 − 0.03246) · 49.02 + 7.930 = 0.4411 + 7.930 = 8.371 mol/s

[73 FR 37331, June 30, 2008, as amended at 73 FR 59334, Oct. 8, 2008; 75 FR 23051, Apr. 30, 2010; 76 FR 57458, Sept. 15, 2011]

§ 1065.659 Removed water correction.

(a) If you remove water upstream of a concentration measurement, x, or upstream of a flow measurement, n, correct for the removed water. Perform this correction based on the amount of water at the concentration measurement, $x_{H2O[emission]meas}$, and at the flow meter, x_{H2Oexh}, whose flow is used to determine the mass emission rate or total mass over a test interval. For continuous analyzers downstream of a sample dryer for transient and ramped-

modal cycles, you must apply this correction on a continuous basis over the test interval, even if you use one of the options in § 1065.145(e)(2) that results in a constant value for $x_{H2O[emission]meas}$ because x_{H2Oexh} varies over the test interval. For batch analyzers, determine the flow-weighted average based on the continuous x_{H2Oexh} values determined as described in paragraph (c) of this section. For batch analyzers, you may determine the flow-weighted average x_{H2Oexh} based on a single value of x_{H2Oexh} determined as described in paragraphs (c)(2) and (3) of this section, using flow-weighted average or batch concentration inputs.

(b) Determine the amount of water remaining downstream of a sample dryer and at the concentration measurement using one of the methods described in § 1065.145(e)(2). If you use a sample dryer upstream of an analyzer and if the calculated amount of water remaining downstream of the sample

dryer and at the concentration measurement, $x_{H2O[emission]meas,}$ is higher than the amount of water at the flow meter, $x_{H2Oexh,}$ set $x_{H2O[emission]meas}$ equal to $x_{H2Oexh.}$ If you use a sample dryer upstream of storage media, you must be able to demonstrate that the sample dryer is removing water continuously (*i.e.,* x_{H2Oexh} is higher than $x_{H2O[emission]meas}$ throughout the test interval).

(c) For a concentration measurement where you did not remove water, you may set $x_{H2O[emission]meas}$ equal to $x_{H2Oexh.}$ You may determine the amount of water at the flow meter, $x_{H2Oexh,}$ using any of the following methods:

(1) Measure the dewpoint and absolute pressure and calculate the amount of water as described in §1065.645.

(2) If the measurement comes from raw exhaust, you may determine the amount of water based on intake-air humidity, plus a chemical balance of fuel, intake air, and exhaust as described in §1065.655.

(3) If the measurement comes from diluted exhaust, you may determine the amount of water based on intake-air humidity, dilution air humidity, and a chemical balance of fuel, intake air, and exhaust as described in §1065.655.

(d) Perform a removed water correction to the concentration measurement using the following equation:

$$x = x_{[emission]meas} \cdot \left[\frac{1 - x_{H2Oexh}}{1 - x_{H2O[emission]meas}} \right] \qquad \text{Eq. 1065.659-1}$$

Example:

x_{COmeas} = 29.0 µmol/mol
$x_{H2OCOmeas}$ = 8.601 mmol/mol = 0.008601 mol/mol
x_{H2Oexh} = 34.04 mmol/mol = 0.03404 mol/mol

$$x_{CO} = 29.0 \cdot \left[\frac{1 - 0.03404}{1 - 0.008601} \right]$$

x_{CO} = 28.3 µmol/mol

[73 FR 37335, June 30, 2008, as amended at 76 FR 57462, Sept. 15, 2011]

§ 1065.660 THC, NMHC, and CH$_4$ determination.

(a) *THC determination and initial THC/CH$_4$ contamination corrections.* (1) If we require you to determine THC emissions, calculate $x_{THC[THC-FID]cor}$ using the initial THC contamination concentration $x_{THC[THC-FID]init}$ from §1065.520 as follows:

$$x_{THC[THC-FID]cor} = x_{THC[THC-FID]uncor} - x_{THC[THC-FID]init}$$

$$\text{Eq. 1065.660-1}$$

Example:

$x_{THCuncor}$ = 150.3 µmol/mol
$x_{THCinit}$ = 1.1 µmol/mol
x_{THCcor} = 150.3—1.1
x_{THCcor} = 149.2 µmol/mol

(2) For the NMHC determination described in paragraph (b) of this section, correct $x_{THC[THC-FID]}$ for initial THC contamination using Equation 1065.660–1. You may correct $x_{THC[NMC-FID]}$ for initial contamination of the CH$_4$ sample train

using Equation 1065.660–1, substituting in CH$_4$ concentrations for THC.

(3) For the CH$_4$ determination described in paragraph (c) of this section, you may correct $x_{THC[NMC-FID]}$ for initial THC contamination of the CH$_4$ sample train using Equation 1065.660–1, substituting in CH$_4$ concentrations for THC.

(b) *NMHC determination.* Use one of the following to determine NMHC concentration, x_{NMHC}: